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(54) Title of the invention Ink jet recording device

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### Specification

#### 1. Title of the Invention

Ink jet recording device

#### 2. Claims

(1) An ink jet recording device characterised in that it comprises a head for discharging a photocuring ink and means for irradiating with light the photocuring ink thus discharged while in flight.

(2) The ink jet recording device according to Claim 1 wherein the light is ultraviolet rays.

(3) The ink jet recording device according to Claim 1 wherein the means for irradiating with light comprises a group of optical fibres and a light source provided at one end of the group of optical fibres.

### 3. Detailed Description of the Invention

#### Field of Industrial Application

The present invention relates to an on-demand type ink jet recording device, which discharges ink droplets according to an image signal so as to form dots on a recording medium, thus printing characters, graphics, etc.

#### The Prior Art

Conventionally, various systems have been proposed for an ink jet head, which is one means of an ink recording technique, and in order to easily discharge a liquid ink without clogging, its viscosity is set low. However, when the viscosity is set low, it gives rise to the problem of ink spread on the recording paper. Because of this, as is disclosed in for example JP-A-62-288048, a method has been proposed in which a solid ink is used, it is heated so as to decrease the viscosity and discharged, and it is cooled and solidified on the recording paper, thereby preventing spreading. The structure of this conventional ink jet head is explained below with reference to FIG. 2.

In the figure, 11 is a solid ink, which is heated and melted by a heater 13 and turns into a liquefied ink 12. This liquefied ink 12 penetrates into an ink impregnation body 22, is discharged as a droplet from a tip 24 of a recording electrode by an electrostatic field between a signal electrode 23 and an opposing electrode 30, and adheres to a recording paper 29. By such means, the ink droplet adheres and solidifies without spreading on the recording paper.

As another conventional example, there is a system disclosed in JP-A-60-132767. This system is explained with reference to FIG. 3.

An ultraviolet ray irradiation device 33 has an ultraviolet ray light source 32 therewithin, a recording paper 31 is irradiated with ultraviolet rays from this ultraviolet ray light source 32, and after an ink droplet 34 from an ink jet head 35 adheres to the recording paper 31, it is cured by ultraviolet rays.

However, in the system shown in FIG. 2, it is necessary to liquefy the solid ink 11 beforehand, and it takes a considerable time to warm up to an operational state. In order to reduce the warming up time, there is a method involving preheating, but in this case, power is required even when it is not used, and the power consumption cannot be ignored. Furthermore, when a low melting point solid ink is used, although the power consumption can be reduced, in this case, ink that has solidified on the recording paper might melt and flow with slight heating, and this is not suitable for practical use.

On the other hand, in the system shown in FIG. 3, since the ink adhering to the recording medium still has low viscosity, and then after some time has passed ultraviolet rays

are applied, the ink easily spreads during that period, which is a problem.

The present invention has been achieved under the above-mentioned circumstances, and it is an object thereof to make possible an ink jet recording device that does not cause an ink to spread on plain paper recording papers other than special papers, and does not require a heating/melting step, which is a drawback of the conventional system employing a solid ink.

### Means to Solve the Problems

On the basis of the above-mentioned object, in the present invention, the above-mentioned problems have been solved by using an ink that cures by light rays such as ultraviolet rays and employing means that irradiates with light rays so as to increase the viscosity immediately after the ink has been discharged from an ink jet head.

### Operation

In accordance with the constitution of the present invention, by irradiating a low viscosity liquid ink, which is resistant to clogging, with light rays having a curing action on the ink immediately after the ink is discharged and curing the ink to a predetermined degree before it adheres to a recording medium, the viscosity can be increased. As a result of this action, the ink can be used for recording without clogging a nozzle part and without spreading on a recording medium.

### Examples

An explanation is given below with reference to drawings.

FIG. 1 is a schematic drawing showing an ink jet device of one embodiment of the present invention. Ink droplets 4, 5, 6 discharged from an ink jet head 1 are irradiated with ultraviolet rays 2 until they have arrived at and adhere to a recording paper 7, thus promoting a curing reaction and increasing the viscosity. 3 is a group of optical fibres, one end thereof being connected to an ultraviolet light source 8 and the other end being disposed along the path of the ink liquid (sic.) 4, 5, 6. The ultraviolet rays 2 are guided by the optical fibres 3 from the ultraviolet light source 8 so as to prevent the ink within the ink jet head 1 from being irradiated. Furthermore, the ink jet head 1 has a structure such that it is completely shielded from external light except a for nozzle opening, thereby preventing curing within the ink jet head 1.

With regard to an ultraviolet curing ink, a composition has as a main component 1,6-hexanediol diacrylate monomer, which has a high curing rate, so that the viscosity

increases in a few ms after discharging and before adhering to the recording paper 7, and after the ink adheres to the recording paper 7 it is still irradiated, thus ensuring complete curing.

By such a function, an ink droplet is selectively discharged from each opening in accordance with a signal from a head drive part, which is not illustrated, and adheres to the recording paper 7, thus forming a recorded image.

#### Effect of the Invention

As hereinbefore described, the present invention enables a full multi nozzle ink jet recording device to be realized by using a photosensitive liquid ink having low viscosity and being resistant to clogging, and by irradiating the ink immediately after discharging from an ink jet head with light rays (e.g. ultraviolet rays) having a curing action the viscosity is increased and the ink is then made to adhere to a recording paper, thereby enabling recording to be carried out even on plain paper without ink spread or nozzle clogging.

#### 4. Brief Explanation of Drawings

FIG. 1 is a side view showing the structure of an ink jet recording device of one embodiment of the present invention,

FIG. 2 is a cross sectional view showing the structure of a conventional ink jet head employing a solid ink, and

FIG. 3 is a side view showing the structure of a conventional ink jet head employing a fixation system using ultraviolet rays.

1...Ink jet head 2...ultraviolet rays 3...Optical fibre 4,5,6...Ink droplets  
7...Recording medium

